Lesson 1

Unit 1

Motion in one direction

Motion:

It is the change of object's location (position) as time passes according to the location of another object.

Simplest type of motion:

1. Is a motion in straight line in one direction (Ex: Metro).
2. Is a forward or backward direction.

Speed:

It is the physical quantity which is used to describe and measure the movement of objects.

N.B

1. If I have 2 cars move on the same road where one car takes a time (T_1 seconds) and the other car takes a time (T_2 seconds) to cover the same distance and $T_1 < T_2$

   So, the first car will be faster than the other because it takes a smaller time span.

2. If the 2 cars move on a road where a red car covers a distance (d1 meter) and a yellow car covers a longer distance at the same time span. ($T_1 = T_2$)

So, the yellow car is faster because it covers a longer distance than the red in the same time span.

From the previous we conclude,

Definition of speed

It is the distance moved through a unit time.

$$V = \frac{\text{distance}}{\text{Time}} = \frac{d}{t} \qquad \text{m / km} \leftarrow \text{sec / hour}$$

So, units of speed is measured by m/sec or Km/hour

N.B $d = V \times t$ $t = d \div V$

Remember:

1. To change from Km/h to m/s $V \times (1000 \div 60 \times 60)$
2. To change the speed of the car from m/s to Km/h

   $Vx (60 \times 60 \div 1000)$

Example (1):

1. A runner runs with a speed 8 m/s find the distance covered by the runner in 10 sec.

Solution $d = V \times t = 8 \times 10 = 80$ m

Note:

To change from m/s to km/h with a car moves at 20 m/s

So, $20 \times (60 \times 60 \div 1000) = 72$ Km/h.

Kinds of speed

1. Regular speed.
2. Irregular speed.
3. Relative speed.

Speedometer:

We find it in cars which help us in identifying the speed of car directly.

1. Regular speed:

It is the change of object's position by equal distances at equal periods of time.

Regular speed = Δ d ÷ Δ t (Δ means delta)

So, Δ d = 20 and Δt = 1 sec

Question

What's meant by an object moves at regular speed 50Km/h?

This means that the object moves in straight line where it covers 50 Km at a time span 1 hour.

Example (2):

Calculate time needed for a train moves at regular speed 100 Km/h to cover a distance of 250 Km?

Solution

V = Δd ÷ Δt ⟶ Δt = Δd ÷ V

Δt = 250 ÷ 100 = 2.5 hours

2.Irregular speed:

It is the change of object's position by *unequal distances* at *equal periods* of time.

OR

It is the change of object's position by *equal distances at unequal periods of time.*

Ex: the movement of a car on road, the speed changes according to traffic)

N.B It is difficult to determine the amount of irregular speed of an object so we use the average speed.

Average speed:

It is the total distance covered by the moving object divided by the total time taken to cover this distance.

Average speed (V) = $\frac{\text{total distance covered}}{\text{Total time}} = \frac{d}{t}$

This means that, the average speed represents the regular speed which the moving object moves to cover the same distance at the same time taken to cover this distance.

When $V = V'$ this motion described as regular speed.

When $V \neq V'$ irregular motion.

Example (3):

A racer covered a distance of 100 m of a straight track in 10 sec, then he returned back walking in 80 sec to come back to the straight point of running, Calculate racer average speed while:

a. Running b. returning c. whole trip

Solution

1. The racer's average speed while running :
   $V' = d \div t = 100 \div 10 = 10$ m/s
2. The racer's average speed while returning:
   $V' = d \div t = 100 \div 80 = 1.25$ m/s
3. The racer's average speed during whole trip:
   $V' = d \div t = 200 \div 90 = 2.3$ m/s

Question

What's meant by average speed of a moving car 40 Km/h?

This means that the result of dividing the total distance covered by the car by the total time taken to cover this distance equal 40.

3. Relative speed:

It is the speed of moving object *relative* to the *observer.*

- If a person is standing on side of the road (observer) to observe two cars, the first car moves 80 km/h and the second moves 100 Km/h.
- The speed of first (Slow) car relative to the observer is 80 Km. while the speed of the second (fast) car relative to observer = 100 Km/h. So, note that speed of the second fast car relative to passenger in the first slow car = 100 – 80 = 20 Km/h.

Measuring the relative speed depends on:

Position of observer.

Example (4):

Two cars move in same direction VA= 30 Km/h and VB = 80 Km/h VC= 40 Km/h in opposite direction.

Calculate: Speed of VB relative to an observer:

a. Stand on the ground.
b. In car A.
c. In car C.

Solution

1. The relative speed of car (B) VB relative to an observer on the ground = 80 Km/h.
2. The relative speed of car (B) VB relative to an observer in car A is 80- 30 = 50 Km/h.
3. The relative speed of car (B) relative to an observer in car (C) is 80 + 40 = 120 Km/h (opposite direction).

How can you calculate the time that light takes from the Sun to reach the Earth? Where light moves in straight direction at constant speed (regular speed) = 300000 Km/sec. and distance between Earth and Sun equals 149.6 million Km.

Speed of light $= \frac{149.6 \times 1000000}{300000}$ = 498. 7 sec = 8.3 min

So

If the Sun set of Sun is at 5 o'clock this means that the light travelled from the Sun at ----------?

Graphic representation of moving in a straight line

First: Graphic representation of speed in a straight line:

Regular (uniform) speed:

To represent the uniform speed graphically: Bring

Tools

1. A toy car operated by a battery.
2. Smooth wooden board- marker- metric strip – stop watch.

Producer

1. Place wooden board at horizontal position.
2. Put 2 marks at known distance.
3. Operate the car and calculate the time necessary to cover this distance.
4. Repeat the previous step by charging the distance and record the time needed for each trial.
5. Write the results in a table.
6. Calculate the speed of the car.

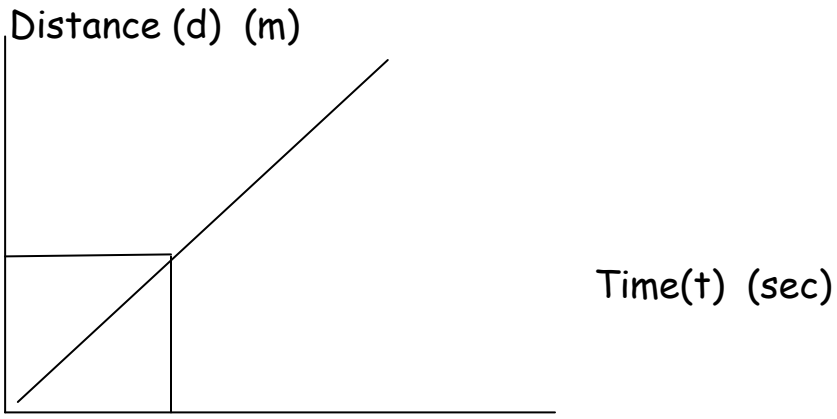
$$V = d \div t$$

7. Plot the distance (d) on vertical Y axis and time (t) on X horizontal axis.
8. Place reading in the table with dots.
9. Match these dots together.

You find that all points lie on a straight line passing the intersection point of the two axis (origin point).

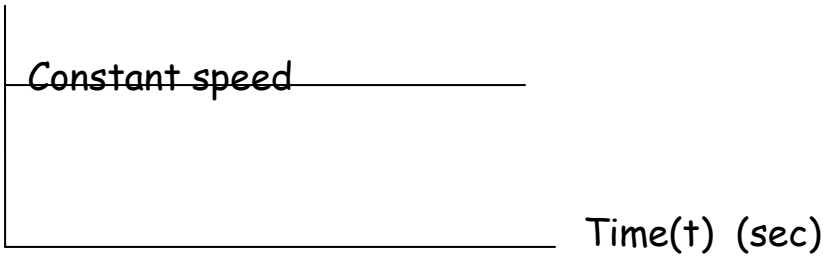
So,

1. The distance is directly proportional to the time.
2. The ratio d/t is constant value which represents the regular speed.



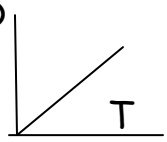
If we draw a graph belt (speed and time):

1. You find that all points lie on a straight line parallel to the time (X) axis.
2. You find that all points lie on a straight line parallel to x-axis.

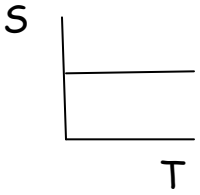


From the previous, we can clarify that movement with regular speed in a straight line:

1. (Distance – Time) graph for regular motion with uniform speed represented by a straight line passes through origin point.

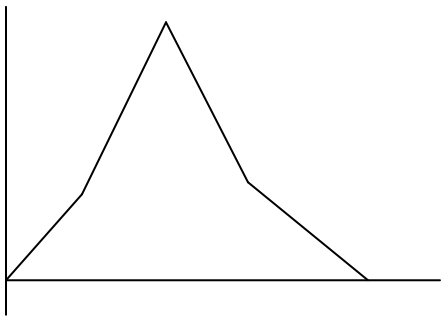


2. (Speed – Time) graph for regular motion at constant uniform speed represented by a straight line parallel to the time axis.



Second: Graphic representation for irregular speed:

Generally the graph which represent the motion of an object moves at irregular speed in a straight line may be *(curved)* or *Zigzag* line *not parallel* to any axis.



Acceleration

When the speed of a car after 1 sec becomes 5 m/sec and after 2 sec becomes 10 m/sec after 3 sec becomes 15 m/sec and so on.
The car movement in this case used the (acceleration) which express the change in car speed in one second.

Acceleration

It is the change of an object's speed in one second.

- When car's speed increases the movement described as (acceleration) (+ve) acceleration.

- When the car's speed decreases by time the movement described as (Declaration) (-ve acceleration).

$$\text{Acceleration (a)} = \frac{\text{final speed V2 – Initial speed V1}}{\text{Time } \Delta t}$$

So, units of acceleration

$$\text{Acceleration} = \frac{\text{speed unit}}{\text{Time unit}} = \frac{\text{m/sec}}{\text{sec}}$$

$$= \text{meter /second}^2$$

Problem (1)

Car (A) starts movement from rest and then its speed increases to 60 Km/h through 5 sec while car (B) starts movement from rest and then its speed increases to 80 Km/h through 10 sec, which of the two cars is moving at a greater acceleration:

Solution

1. Acceleration of car (A) = $\frac{V_2 - V_1}{t} = \frac{60 - 0}{5} = 12\ m/s^2$

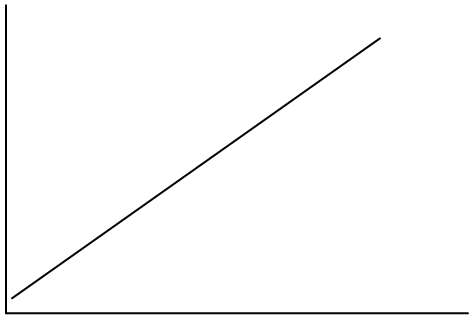
2. Acceleration of car (B) = $\frac{V_2 - V_1}{t} = \frac{80 - 0}{10} = 8\ m/s^2$

Uniform acceleration

It is the change (increase or decrease) of object's speed by equal values through equal periods of time.

- When we represent the relation between object's speed and time we obtain *straight line* passes through *the origin*.

Speed m/sec



Time

Question

What's meant by?

A car moves at uniform acceleration equals 10 m/sec^2?

This means that the car's speed changes with 10 m/s each second.

Problem (2)

If a car moves at 60 m/s then after 2 sec. its speed becomes 30 m/s and it stopped after another 2 sec. calculate acceleration by which the car moves and mention its kind:

Solution

1. During 1st two sec = $\frac{V_2 - V_1}{\Delta t} = \frac{30 - 60}{2} = -15\ m/s^2$
2. During 2nd two sec = $\frac{V_2 - V_1}{\Delta t} = \frac{0 - 30}{2} = -15\ m/s^2$

The car moves with → uniform

→ Deceleration (Negative acceleration)

Physical quantities (Scalars and vectors)

Unit 1

Physical quantity:

It is any quantity that can be determined and has a unit of measurement in our life such as mass, length, time, speed, force, energy and temperature.

N.B Each physical quantity is measured in a special measurement unit.

Types of physical quantities:

1. Scalar quantities.
2. Vector quantities.

1. Scalar Physical quantities:

It is the physical quantity that has magnitude only and has no direction.

Examples: Such as we say the body mass equals 10 kg.

Examples of scalar physical quantities:

Scalar quantities	*Unit*
Mass	Kilogram (Kg)
Length	Meter (m)
Speed	Meter per second (m/sec)
Time	Hour or second
Energy	Joule
Temperature	C° or F

Give reason for:

Length and time are examples of scalar physical quantities.
Because they have magnitude only and have no direction.

2. Vector Physical quantities:

It is the physical quantity that has magnitude and direction.

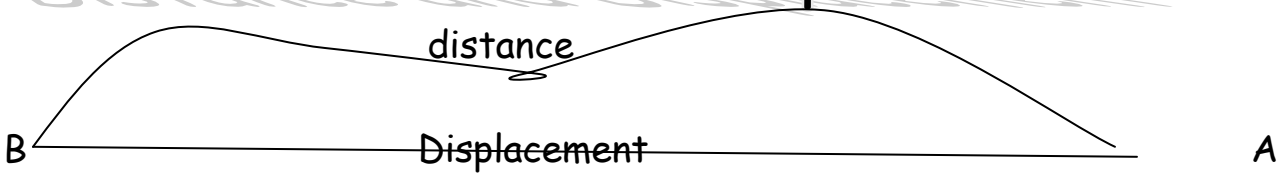
Examples:

Acceleration and force

Examples of vector physical quantities:

Vector quantities	*Unit*
Acceleration	Meter per second^2 (m/sec^2)
Force	Newton (N)
Displacement	Meter (m)
Weight	Newton (N)

Distance and Displacement



When car moves from position A to position B as shown in figure:
The length of the curved line gives *the distance* that covered by the car.
While, *the straight line* that starts from point (A) and ends at point (B)so, AB direction gives the displacement of the car and this the shortest length between AB *Displacement*.

Distance:

It is the actual length of the path that a moving object takes from the start point to end point.

Displacement:

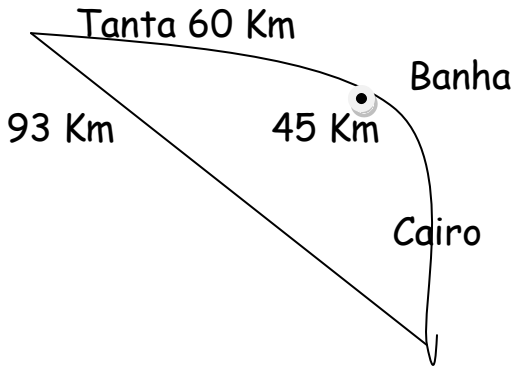
It is the length of the shortest straight line between two position (d).
What's meant by the displacement of Alexandria from Cairo is 200 Km in western north direction.
This means that, the length of the shortest straight line from Cairo to Alexandria is 200 Km in western – north direction.

Note that

If the trip's Cairo ⟶ Banha ⟶ Tanta ⟶

Distance = 45 Km + 60 Km = 105 Km

While the displacement here is 93 Km



The difference between distance and displacement:

Points	*Distance (d)*	*Displacement (d´)*
Definition	It is the actual length of the ----------.	It is the shortest distance --------.
Determined by	Magnitude only	Magnitude and direction.
Kind	Scalar quantity	Vector quantity
Measuring unit	Meter	Meter

Velocity

It is the rate change of displacement

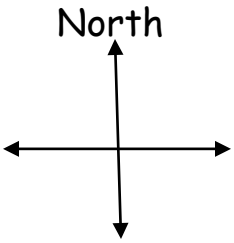
OR

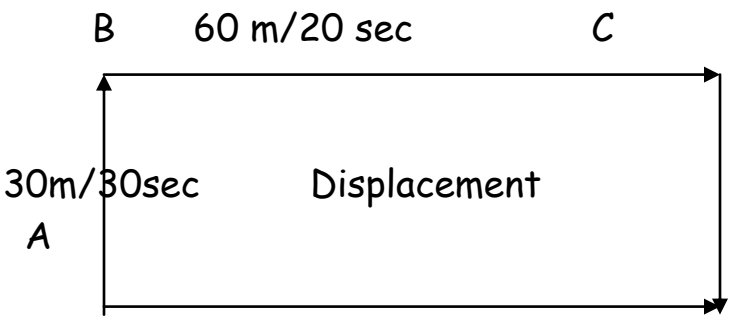
It is the displacement covered in 1 second.

Velocity unit is m/sec or Km/h as speed exactly but it differs than speed that it is a vector quantity.

It represents the speed of objects in certain direction.

Example





A person covers 30 m northward from A ⟶ B within 30 sec then 60 m eastward from B ⟶ C within 20 sec and 30 m southward from C ⟶ D within 10 sec.

So, start point A + End point D

Distance covered by this person = 120 m

(30 +60 + 30)

While displacement lies between $\overrightarrow{AD}$ = 60m in eastward direction.

Average speed = $\frac{\text{total distance}}{\text{Total time}} = \frac{120}{60} =$ 2 m/s

While

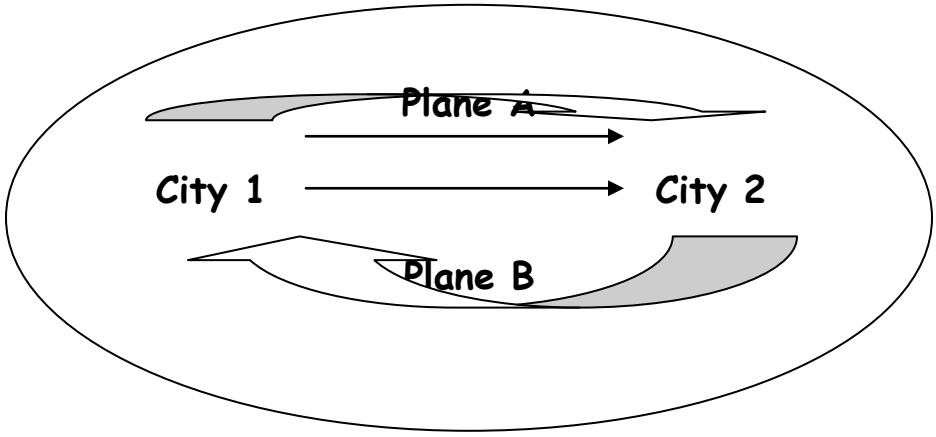
Average velocity = $\frac{\text{Displacement}}{\text{Total time}} = \frac{60}{60} =$ 1 m/s

In the eastward direction

Science technology and society

Note that

- Cheetah is the fastest animal.
- The Earth revolves around itself a complete round each 2 hours. This movement causes the movement of wind above its surface.
- Pilots take into consideration the direction of wind speed to calculate amount of fuel necessary to complete the trip.
- Assuming that a plane (A) flew from city (1) to (2) against wind direction it will takes a longer time than plane (B) that travels with wind direction because it flies without wind resistance so, plane A need more fuel than plane B to cover the same distance.



Lesson 1

Unit 2

Mirrors

When you look at mirror or on a surface of water swimming pool you will see your face image on water or in the mirror.

This is happened due to (light reflection).

Light reflection

It is the phenomenon of the light bouncing "return back" off in the same medium when it meets the reflecting surface.

i.e light rays from a source of light directed to an object then reflected from it on a reflecting surface like mirror then you can see the reflected light rays to your eyes.

Reflecting surface means surface like mirrors or still water.

Reflecting in all types of mirror is governed by 2 principal laws.

Activity

To discover the 2 laws of light reflection bring these materials:

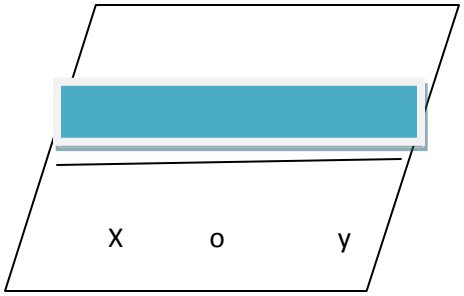
1 -plane mirror 2 -white paper sheet

3 -pins 4 -protector 5 -ruler.

Steps **:**

1 –Fix a plane mirror on a white paper perpendicular to it.

2 –Draw a straight line XY on the paper.



3 –Draw a straight line (OD) (the normal) perpendicular on the XY line.

4 –Draw a straight line (AO) (representing incident ray).

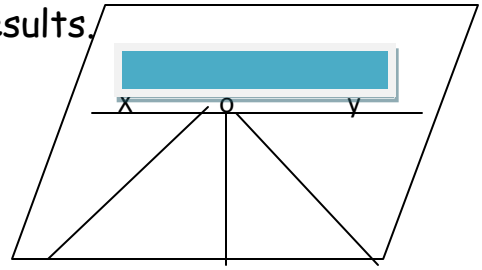
Place two pins P1+P2 on the AO line horizontally.

Look at the other side of the mirror to see the images of the pins P1+P2 and place P3 and P4 two pins to be straight line with P1+P2.

Connect between P3 and P4 a line to meet the reflecting surface on (O) position.BO.

Measure the angle of BO using a protractor which makes with the normal and compare it with the AO angle with the normal.

Repeat these steps and change value of the incidence angle and assign each time the angle of reflection and record your results.



Observation:

The angle of incidence = the angle of reflection.

Conclusion

Reflection of light is governed by 2 laws:

First law:

angle of incidence= angle of reflection.

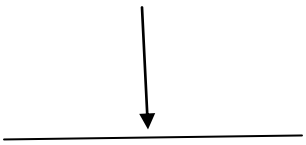
Second law:

the incident light ray, the reflected light ray and the normal to the surface of reflection at the point of incident all lie on the same plane perpendicular to the reflecting surface.

N.B

If the incident light (fallen light) falls on a reflecting surface perpendicular to the what will the values of falling angle?

In this case the falling angle = zero and the light will be reflected on itself.



From the previous we conclude,

The incident light

It is the light ray that falls on the reflecting surface.

The reflected light

It is the light ray that bounces (returns back) from the reflecting surface.

Angle of incident:

It is the angle between the incident light ray and the normal.

Angle of reflection:

It is the angle between the reflected light ray and the normal.

Mirrors

there are many types of mirrors:

1 –plane mirror.

2 –spherical mirror { concave mirror & convex mirror }.

Plane mirror

Is a piece of plane glass, painted from behind with a layer of metal.

Properties of image formed by a plane

1 -The image is upright (erect).

2 -The image is equal to the object in size

3 -The image is laterally inverted (reversed).

4 -The image is virtual (cant be received on a screen).

5 -The distance between object and the mirror is equal to the distance between image and mirror.

6 -The straight line joining the object to its image is perpendicular to the surface of the mirror.

Give reasons

The word "**Ambulance**" is written in a converted way on the ambulance car?

In order to appear in the mirrors of the car written in a correct way and can be read by the drivers.

Spherical mirrors

It is a mirror that its reflecting surface is a part of hollow sphere.

Types of spherical mirrors

1 -**concave mirror**: The mirror which its reflecting surface is a part of the inner surface of the sphere.

{It **converges** or collects light rays}.

2 -**convex mirror**: The mirror which its reflecting surface is a part of the outer surface of the sphere.

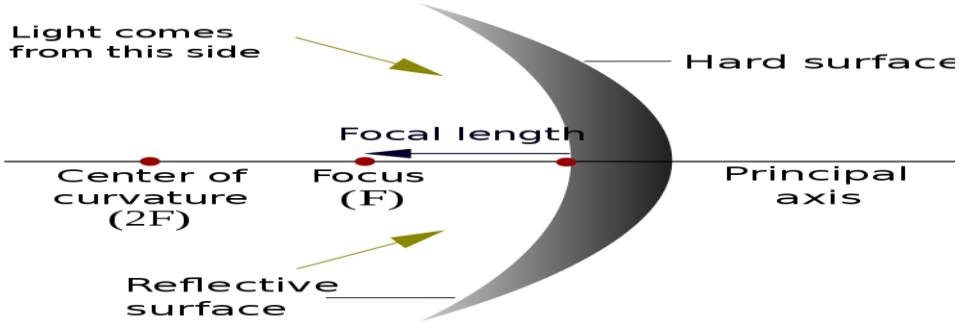
It **Diverges** light rays after reflection.

Example of spherical mirror: "spoon":

Inner surface is concave.

Outer surface is Convex.

Concepts related to the spherical mirrors:



1. Center of mirror curvature C

It is the center of the sphere that the mirror is considered a part of diagram

So it is in front of the concave mirror or behind the convex mirror.

2. Pole of the mirror (p):

It is the point that is in the middle of the reflective surface of the mirror.

3. Radius of mirror curvature:

Radius of sphere that the mirror is a part of it.

4. Principal axis of the mirror:

It is the Straight line that passes by the pole of the mirror (P) and its center of curvature (C).

5.secondary axis of the mirror:

It is the straight line that passes by the center of curvature of the mirror and any point on its surface except the pole.

6. focus of the mirror: F

It is the point of collection of the parallel rays which are parallel to the principal axis after being reflected from mirror.

7- focal length of the mirror:

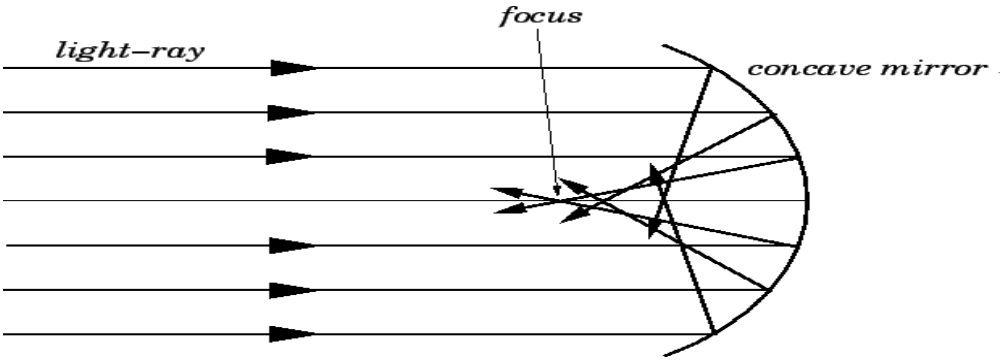
It is the distance between focus of the mirror [F] and its pole [P].

N.B Each spherical mirror has uncountable secondary axis and one principal axis.

Concave Mirror

The focus of the concave mirror:

It is produced due to the collection of the reflected rays emitted from a far object.



To determine the focal length of the concave mirror:

Bring: Concave mirror – Screen - Source of light.

1-Place a concave mirror facing the sun rays.

Observation:

Parallel rays falls on the concave mirror.

2- Move the screen in front of the reflecting surface of the mirror to obtain the smallest and clearest image.

Observation:

The rays after being reflected collect in one lit point which is called the focus of the mirror that can be received on the screen.

3- Measure the distance between the lit point and the pole of the mirror.

This distance = $\frac{1}{2}$ radius of mirror curvature

(focal length of mirror).

Conclusion:

The point of the collection of the parallel rays after being reflected from the concave mirror is called (the focus of the mirror).

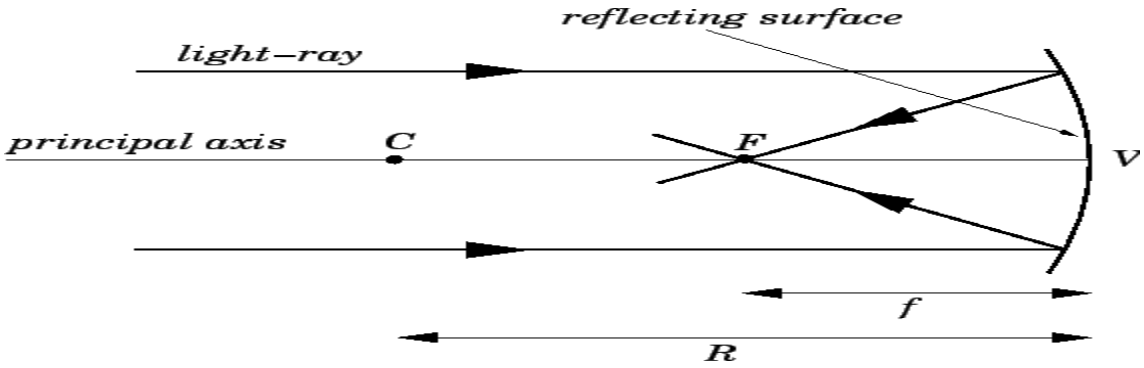
The distance between the focus of the concave mirror and its pole called (focal length of the mirror).

Focal length f = $\frac{1}{2}$ x radius of curvature.

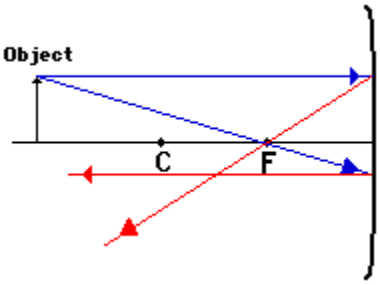
$F = \frac{1}{2} \times r$

Rules for light rays meeting the concave mirror:

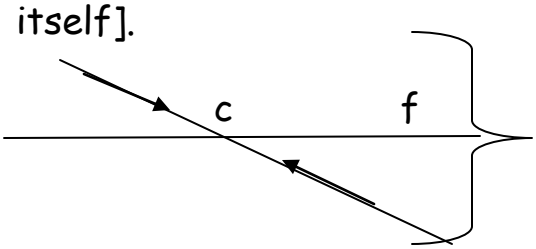
1. If the path of the incident ray parallel to the principal axis, it reflects passing through the focus.



2. If the incident ray that passes through the focus (F), it reflects parallel to the principal axis.



3. If the incident ray that passes through the center of the curvature (c) it reflects back through (c) [it reflects on itself].



Because it falls perpendicular to the spherical mirror so its incidence angle equals (zero).

To determine the position and characteristics of the images formed by concave mirror follow the following steps:

1-Use the protractor in drawing a spherical surface and its center is (c) that represents the concave mirror.

2- Draw the principal axis and determine on it the position of the focus, then draw a vertical arrow on the principal axis to present an object.

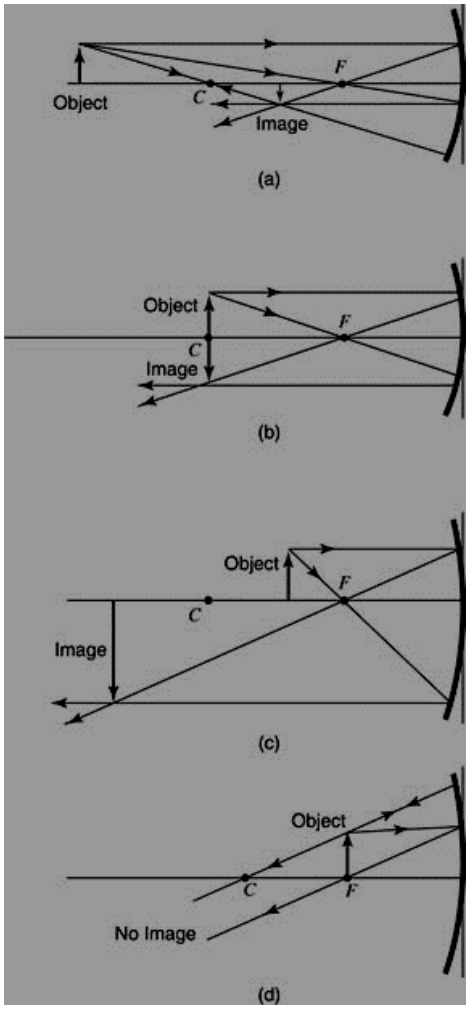
3. Determine the center of curvature where the radius of the sphere= 2 focal length.

4- Draw the ray from the highest point in the object where it falls parallel to the principal axis and thus reflects passing through focus.

5-Draw another ray passing through the spherical center of the mirror then reflects on itself.

6- Determine the position where the (2) reflecting rays meet, which is the image of highest point on the object.

7- Determine the position and characteristics of the image formed.

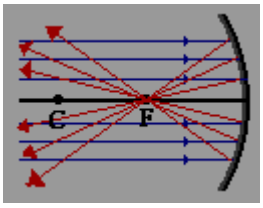


1. The position of the object is very far:

The position of the image is at the focus.

Properties of formed image: Real

Very tiny (dot).



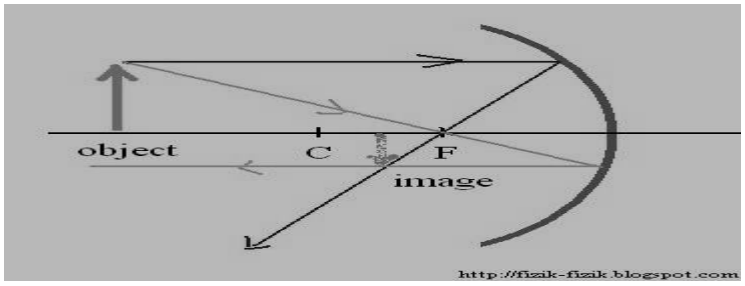
2. The position of the object is at a distance larger than radius of curvature (after center of curvature):

The position of the image is at a distance greater than the focal length (between the focus and center of curvature).

Properties of formed image: - Real.

- Inverted.

- Small.



3. The position of the object is at the center of curvature (C): equals the radius of curvature:

Position of the image : At the center of curvature .

Properties of image: - Real.

- Inverted.

- Equal to the object.

4. The position of the object is between focus and the center of curvature

(at a distance more than focal length but less than radius of curvature).

The position of the image : after the center of curvature

(distance larger than the radius of curvature).

Properties of image: - Real.

- Inverted.

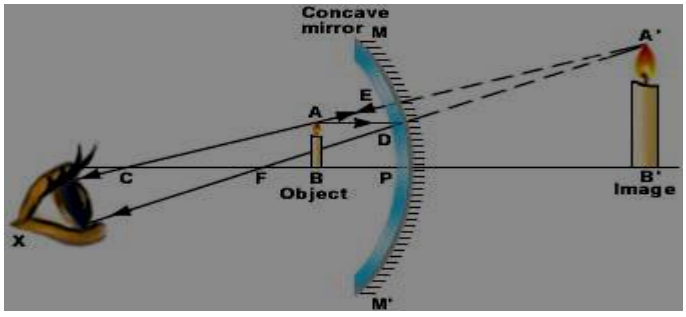
- Magnified.

5. The position of the object is between focus and the pole (at distance less than focal length).

Position of the image : behind the mirror.

Properties of the image : -virtual.

- Erect. -Magnified.



To determine the radius of mirror curvature:

Materials: - concave mirror

- Holder for mirror.

-Light box with a hole.

Steps:

1. Place the mirror on the holder in front of light source.

2-Move the mirror nearer and farther until the image of the hole is formed next to it and is equal to it.

3-Measure the distance between the mirror and the hole =it is equal to the radius of curvature of the mirror.

Observation and conclusion:

Since of mirror curvature **r =2f.**

Therefore length of mirror = **f = r/2.**

Uses of concave mirror:

Concave mirror is a converging mirror, so that it is used for many purposes examples: solar ovens.

Convex mirror

The formed image cannot be received on the screen, because the incoming rays diverge after reflection.

Properties of the formed image by a convex mirror

Wherever the position of the object in front of the convex mirror, the image is:

-smaller than object .

-upright (erect).

-Virtual cant be received on a screen.

Uses of the convex mirror:

1-convex mirror is used as side-view mirror on the passenger's side of a car, because **it forms an erect, smaller image for the way behind the car.**

2- Suitable for convenient shop for anti-thief.

3- Used in turning off the road and parking.

Science, technology and society

Land surveyors and topographical scientists use a mirror provided with lazer ray to determine hights and distances and to make very accurate measurements to calculate- time that light beam bounced (return back) from a distance point and returns to its source.

History:

According to old Greek legend that Archimedes knew a lot about mirrors and the use of sun light as weapon against the roman fleet that invaded in ziz B.C.

Lenses

The main structure of the human eye is a colored transparent part which is called the lens.

The Lens:

It is a transparent medium that refracts the light and is limited with two surfaces. It is glass or plastic

Uses of the Lenses:

1- Medical eye glasses either for reading or walking.

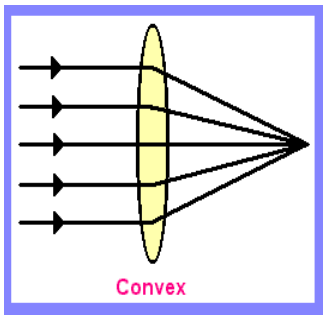
2- For person who fixes the watches use a magnifier lens to see the minute parts of watches.

3- In the war the leaders use binoculars to follow the battles.

4- Also the lenses are used in the manufacture of many things as, projectors, cameras, telescopes and magnifying lenses.

Types of Lenses:

A) Convex lenses



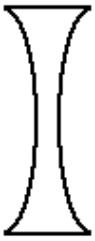
A. Convex lens

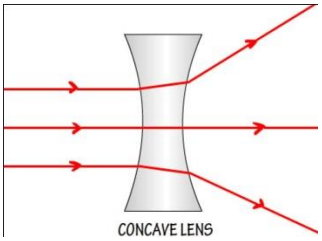
-It is thick at the centre and less thickness at the tips.

It collects light rays falling on it, so it is called converging lens.

B. Concave lens

-It is thin at its centre and more thick at the tips.



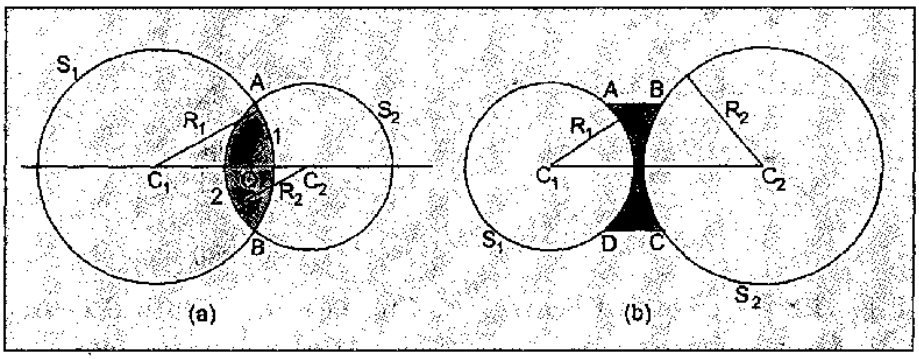


-It separates light rays, so it is called diverging lens.

Special concepts related to the lenses

1-The centre of curvature of the lens face:-

It is the centre of the sphere, where this face is a part of it.

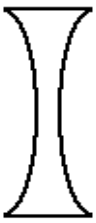


C1 and C2 **Fig. 11.8 Each surface of a lens is a part of a sphere**

2. The optical centre of the lens(P)

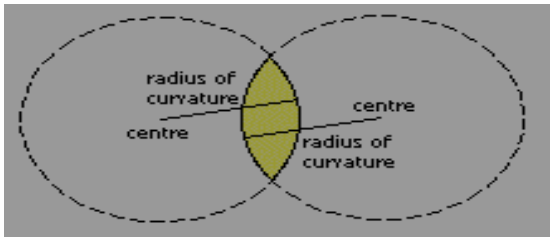
It is a point inside the lens placed on the principal axis in the mid distance between its faces.

Convex lenses



3. The radius of curvature of the face of the lens (r)

It is half the diameter of the sphere where this face is a part of it



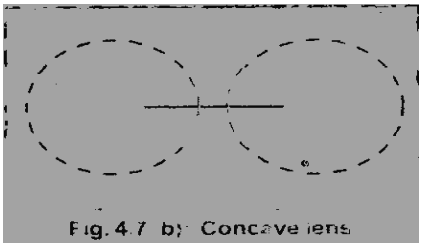


Fig. 4.7 b) Concave lens

4. The principal axis :-

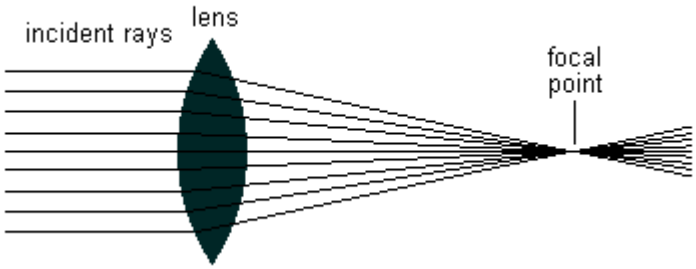
It is the line between the two centers of the lens passing by the optical centre of the lens.

5. The secondary axis:-

It is any line passes by the optical centre of the lens except the principal axis

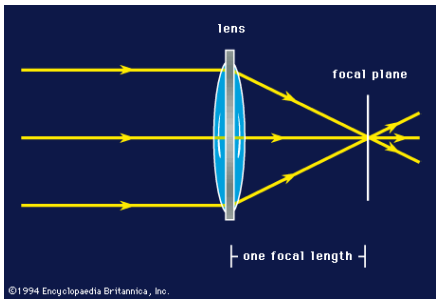
6. The focus of the lens (F)

It is the point of collection of the parallel light rays after refraction from the lens.



7.The focal length of the lens (f):-

It is the distance between the focus and optical centre of the lens



f=1/2 r

Each lens has one principal axis and more than secondary axis

The lens has two centers of curvature

The lens has two foci ➡ Because it has two circular surfaces.

The Convex lens

- The focus of the convex lens (converging):-

If the light rays from the sun or any distant source fall on the lens, the rays will be collected in one point called [the focus of the lens]

To determine the focal length of the convex lens:-

Steps:

1. Fix the lens on a holder where the far light source (the sun or any distant object) is facing one of its faces
2. Move the screen closed and farther from the other side of the les until you got the lit point
3. Measure the distance between the lit point and the optical center of the lens.

Observation

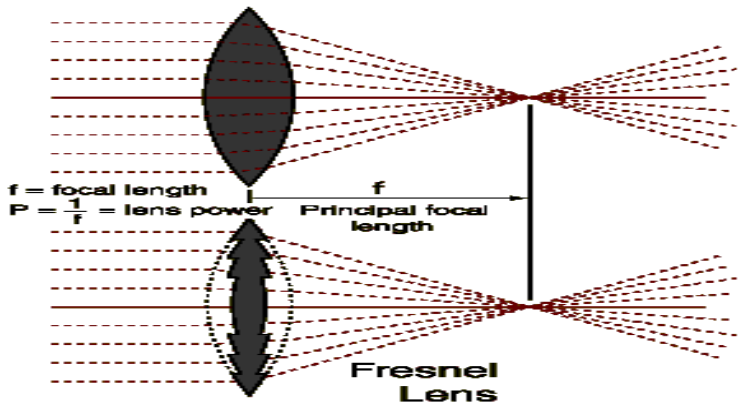
1. Parallel rays fall on the lens.
2. The rays after being refracted, collect in one lit point is called the focus of the lens that can be received on a screen. This distance = 1/2 radius of curvature of the face of the lens.

Conclusion

1. The convex lens is a converging lens as it collects the refracted rays.
2. The point of collection of the parallel rays produced from the sun or any distant object being refracted from the convex lens is called **(the focus of the lens).**
3. The distance between the focus of the lens and its optical centre is called (**the focal length of the lens).**
4. The focal length (F) = 1/2 r.

Note:-

1-The thin length has greater focal length than the thick one, because the radius of the thin lens is bigger than that of the thick Lens.



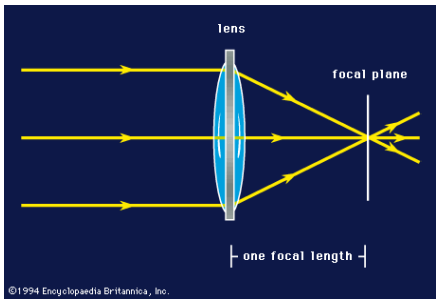
2-We can burn a paper by using a convex lens.

Because convex lens converge and direct sun light in one point (focus).

3-The image formed by convex lens is real image.

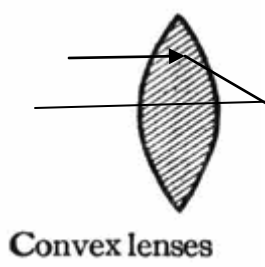
Because it is formed as a result of collection of refracted rays.

The rules for light rays meeting convex lens.



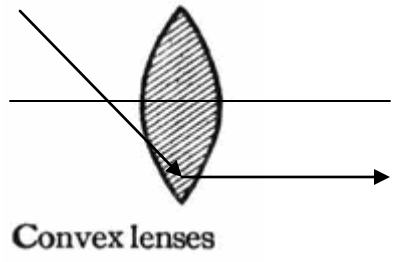
1. The incident ray that is parallel to the principal axis:

- The path of the emergent ray refracts passing through principal focus.

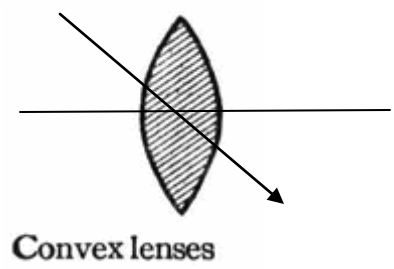


2. The incident ray that passes through the focus:

- It exists the lens parallel to the principal axis.



3. The incident ray that passes through the optical centre of the Lens.



- It continues to pass inside the lens and exist without refraction.

When you place an object in front of the convex lens, the position of the images formed and their characteristics can be determined by using only 2 rays from the previous 3 rays.

*-The cases of the formation of the images by the convex lens

Steps:

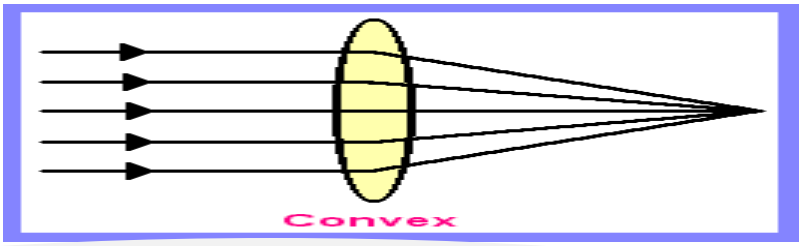
1. Use the protractor& draw the convex lens, then draw the principle axis of the lens.
2. Determine the position of the focus[F]& the center of curvature [C] on the principle axis from both side of the lens.
3. Draw a ray coming from the highest point of the object, so it falls parallel to the principle axis, so it refracts passing through the focus.
4. Draw a ray from the same point passing through the optical center of the lens, thus it exits from the lens without refraction.
5. To determine the position when 2 intersections of the 2 penetrating rays determine the image of the lit point.

6. Determine the position & characteristics of the images formed by the convex lens.

➢ Case 1:

The position of the object:

Very far.



The position of the image

At the focus.

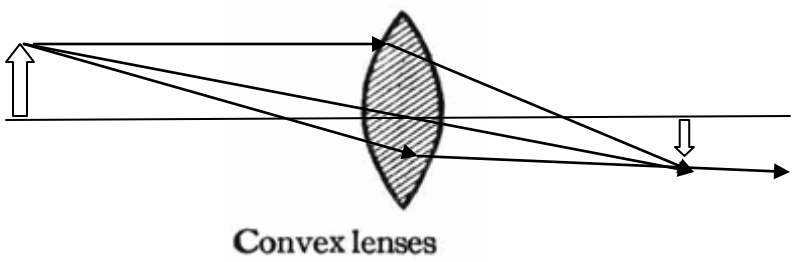
The properties of the formed image :

Real --- Very tiny [dot]

➢ Case 2:

The position of the object:

At a distance greater than double focal length [after the center of curvature]



The position of the image

Between the focus& the center of curvature.

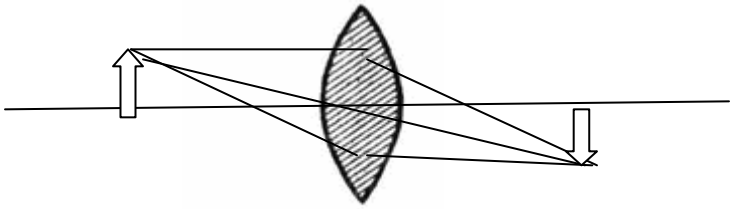
The properties of the formed image :

Real -- Inverted –Small [diminished]

Case 3:

The position of the object:

At the center of curvature (C) – at a distance equals the radius of curvature.



Convex lenses

The position of the image

At the center of curvature.

The properties of the formed image :

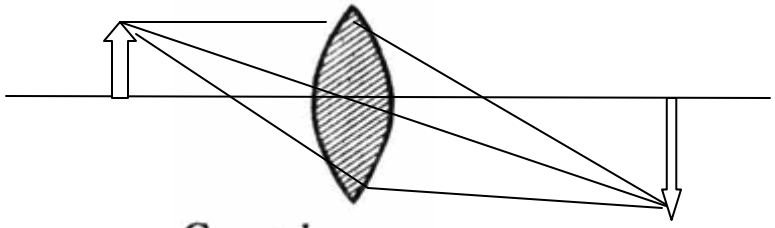
Real – Inverted – Equal to the object.

Case 4:

The position of the object:

Between the focus& the center of curvature.

[at a distance more than the focal length but less than the radius of curvature]



Convex lenses

The position of the image

After the center of curvature.

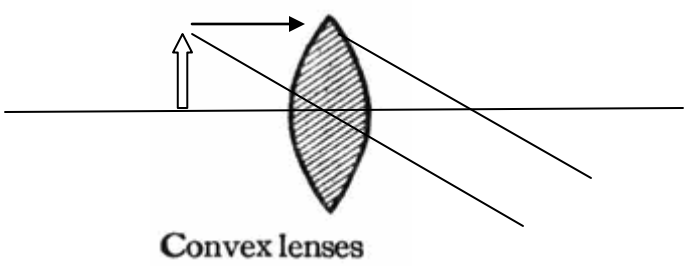
The properties of the formed image :

Real – inverted – Magnified.

Case 5

The position of the object:

At the focus.



The position of the image

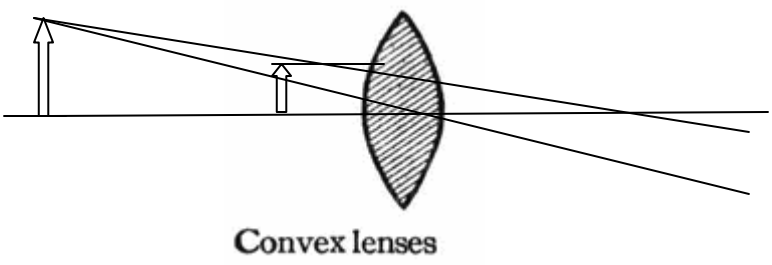
No image is formed.

[The image is at infinity where the rays penetrate are parallel.

Case 6:

The position of the object:

Before the focus [At a distnce less than the focal lenghth.



The position of the image

After the position of the object in the same side [in front of the lens]

The properties of the formed image :

Virtual – Erect – Magnified.

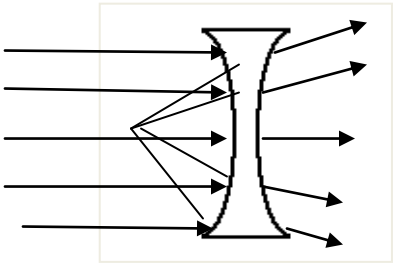
Concave lens

In the concave lens, the parallel rays that pass through the lens are diverging and their extensions are collected in a point called the (diverging virtual focus of the concave lens) in front of the lens.

The virtual focus of the concave lens:-

The virtual focus of the concave lens:-

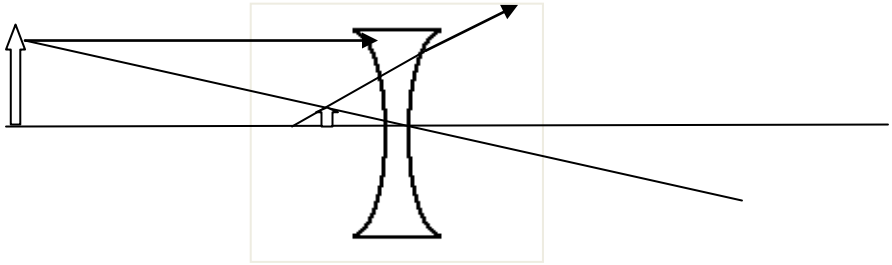
It is the point of collection of the extensions of refracted rays by a concave lens.



Properties of the formed image by the concave lens:-

1- Position of the object:

In front of lens.



2-Position of the image:

Before the object in the same side.

3-Properties of the formed image

The image always:- Virtual - Small - Erect.

G.R. The image formed by the concave lens is a virtual image.

Because it cannot be received on a screen.

Compare between :

Real image	Virtual image
It is formed as a result of the intersection of the reflected or refracted light rays.	It is formed as a result of the intersection of the extensions of the reflected or refracted light rays.
It can be received on a screen.	It cannot be received on a screen.
It is always inverted.	It is always erect [upright]
It is larger or smaller than the object.	It is larger, smaller or equal to the object.

The vision

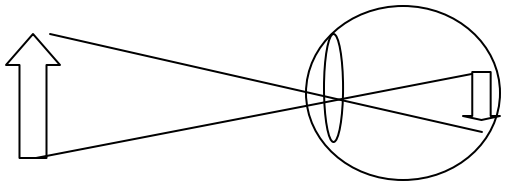
The light rays reflect from the body to fall on the eye.

-The light rays refract when passing through the cornea then the lens (convex lens).

-The refracted rays are collected on the retina forming a small, real, inverted image.

-The optic nerve transmits the image to the brain to re-corrects the image to become erect and in natural size.

Notes:-



1-The diameter of the eye ball is the distance between the optical centre of the lens and the retina.

2-To see clearly, the image must be formed on the retina.

3-The normal person can see clearly the:-

-Near objects at distances not less than 25 cm.

-far objects till 6 m.

The use of lenses to treat the vision defects:-

-Short-sighted -Long-sighted

Vision defects occur because the eye cornea is not always convex or the eye is not always spherical

1. Short sight

It is the vision defect through which near objects can be seen clearly but far objects seen distorted.

The image of far objects in short-sight, do not fall on the retina of eye .but in front of it

The reasons of short-sight:-

1-The increase in the eye ball diameter. This causes the retina to be far from eye lens

2-The increase in the convexity of the eye lens surface results a small focal length of the eye lens. The parallel rays coming from far object are collected at a point in front of the retina and disperse after that forming unclear image.

Correction of short-sight:-

By using a concave lens which disperses the rays to form diverged image of the object on the retina. So short-sighted person needs a medical eye glasses with concave lenses .

2. Long - sight

It is a vision defect through which far objects only can be seen clearly but close objects are not seen clearly

The image formed behind the retina.

The reasons of long-sight:-

1-The decrease of the eye ball diameter. This causes the shortness of the radius of the eye sphere, thus the retina is close to the eye lens.

2- The decrease of the convexity of the eye lens surface. This results more focal length, so the rays coming from near objects are collected in a point behind the eye retina

Correction of long-sight:-

By using a convex lens which collects the rays, so the image of the object is formed on the retina. There for, long-sighted person need a medical eye glasses with convex lens.

Contact lenses:-

The contact lenses are used instead of the glasses.

It is very thin lens made of plastic and can stick to the eye cornea by the eye fluid.

Cataract:-

The eye gets injured by some diseases.

This is due to some reasons:-

1. Old age 2. Illness 3. Side effects of drugs
4. Genetic readiness

Symptoms:-The lens becomes dark.

Treatment:- surgery to change the eye lens transplanted permanently in the eye. So the person can see again and clearly.

Lesson 1

Unit 3

The Universe

Def. of the Universe :

It is the space which contains all galaxies, stars, planets, moons and living organisms.

- **"Everything on the earth".**

Note that

- The universe is very vast.
- The sun and earth are tiny parts in the universe.

Stars :

large - round bodies- generating great amounts of **heat&light**

They seem small points as they are millions of kilometers away from us.

- Although stars are very far from each other, they form groups called (**Galaxies**).

The universe contains many galaxies and each galaxy has a distinctive shape according to the harmony and order of the groups of stars in it.

- The stars move in fixed orbits around the center of the galaxy.
- The galaxy that our solar system belongs to is known as
- (The Milky Way Galaxy).
- ***The Milky Way Galaxy***
- Spiral galaxy. - Contain more than 200 billion star.
- In the center of the galaxy a lot of old stars gather surrounded by small stars which is located in the spiral arms of the galaxy.

- The milky way is given that name bec. It appears in the sky at night as splashing milk or spreading straw.

The components of the universe

- **The universe :**
- Wide extended space contains galaxies.
- No. of galaxies = 100.000 million galaxies.
- **Galaxies :**
- Group of stars rotate together in cosmic space by effect of gravity.
- Bigger units form the universe.
- Gather in clusters.
- Move away from each other.
- Rotate in a system around center of the universe.
- **Clusters of galaxies.**

Group of galaxies that rotate together in cosmic space by gravity.

The milky ways

It contains the sun and solar system.

- The solar system :

Consists of one star which is the sun and eight planets revolving around it including the planet Earth on which we live.

Distance between stars are very large, so, the distances in the far space are not measured in km. → measured by light year.

Light year

It is the distance covered by light in one year and it equals 9.467×10^{12} km. (9460000 Million Km).

Example

Whats meant by : The distance between the sun and a star is three light years :

Distance = $3 \times (9.467 \times 10^{12}) = 28.401 \times 10^{12}$ km

Solar system

- Solar system consists of eight planets revolving around the sun.
- Sun and surrounding planets revolve around the center of the galaxy.
- Sun takes about 20 million years to complete one rotation around the center of the galaxy.
- Solar system is located in one of the spiral arms of the milky way an the edge of the galaxy.

How did the universe originated

- Scientists believe that the matter of the universe was originally.

Gaseous ball

- High pressure
- High temp

* small in volume.
* constant in expansion.

The Big Bang theory is the mast believed theory for the universe originated.

Stages of the Big Bang explosion,...

1- Big bang stage.

2- Stage of galaxies formation.

3- Stage of stars and solar system.

4- Stage of earliest life formation.

5- Recent stage.

Stage 1, Big Bang

- Explosion happened → expanded rapidly and suddenly.
- Density of the gaseous ball ↓ and temp ↓.
- The atomic particles merged to form primary gaseous cloud from hydrogen and helium.

Stage 2,

- After billions of years
- Primary gaseous clouds connected together → forming homogenous small clouds.

-These clouds represent the primary matter of the galaxies.

-Note that continuous contraction and expansion help in this formation of the primary matter of galaxies.

Stage 3,

Galaxies are formed

after 3000 million years.

Stage 4,

Our galaxy (Milky Way) took its disc form after 5000 million years.

Stage 5,

After 10000 million years

Sun and earth planets created.

Stage 6,

Earliest life forms began to appear on earth.

Activity to show expansion of the universe and separation of galaxies,

- Bring some flour and mix it with water and some bread yeast. Mix the components well to make bread dough (representing universe).
- Insert some raisins in dough (representing galaxies).
- Leave the dough to ferment in warm environment.

→ Observation, - dough expands.

- grains of raisins become apart

Similarly the separation of grains of raisins resembles the separation of galaxies.

Note :

Scientists discovered radio waves coming from space.

They concluded that these waves are a type of the echo coming from Big Bang.

** Cosmogony in ancient times

Origin of the universe in old ages :

- Myth dominated the human imagination.
- By development of human mind, it became clear to the ancient Egyptians and Babylonians the relationship between the eternal universe and the multiple Gods controlling it.
- Philosophers of Greek and Romans attempted to develop theories of cosmic phenomena.

Astrology prevailed at both Indian and Chinese civilization.

Future of the Universe

Opened universe theory
↓
No definite end

Clased universe theory
↓
Universe will stop expand and begin to contract unit it become hot preparing new big bang

The Solar System

Unit 3- L2

Solar system consists of :

1- Sun.

2- 8 planets revolving around the sun.

3- Comets.

4- Asteroids.

5- Moons.

- Solar system extends over 12000 million km in space.
- In the past → they thought that the solar system is the center of the universe.

  Now → Astronomic system is considered just a tiny spot compared to the rest of the universe.
- The planets and other celestial objects were originated in the system since 4600 million years from the matter remained from the evolution of the sun.

The Sun

- Biggest star in solar system.
- The sun represents more than 99% of the total mass of the solar system.

Gravity in the solar system

- Newton discovered the (1) gravitational force towards the ground.
- And he proved that there is a force of gravity "attraction force" among (2) planets and the sun, and between (3) planets and moon.

So, all planets revolve around the sun in fixed orbits by the action of attractive force of the sun on these planets → (Central gravitational force).

And this depends on → the mass of each object.

→ the distance between them.

Def. of central gravitational force (centripetal force) :

- It is the force that keeps the planets in continuous rotation along their orbits around the sun.

Newton's law of universal gravitation:

The force of attraction between two bodies is directly proportional to the product of their masses and inversely proportional to square of the distance between them.

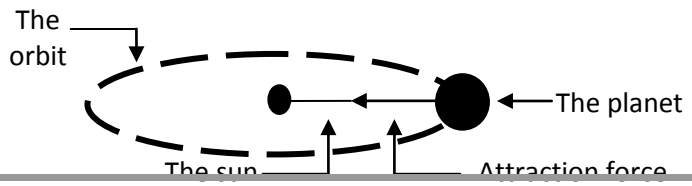
↑ attar → ↑ mass

↓ att → ↑ distance^2

Note

- By Gravity :

- The matter of the celestial body remains firm.
- Also it attract gases towards planet or moon forming the atmosphere around it.
- If there is no gravity "no attraction force" between sun and Earth the earth will leave its orbit and float in a random fashion in space → destruction of earth.



Note that as the planet moves away from sun → gravity ↓ and so it become slower.

Theories about the evolution of solar system

There are about 20 theories about the evolution of the solar system.

The important theories are :

1- Nebular theory.

2- The crossing star theory.

3- The modern theory.

4- Recent theories.

I- Nebular theory : (Laplace 1796) :

- French scientist (Pierre Laplace) published a research entitled (World order).
- The research included a perception about the evolution of the solar system affected by two observations which are :

1- There is something that looks clouds or nebula in the space.

2- The space contains many clouds surrounding planets.

Assumption of Nebular theory :

1- The solar system was a glowing gaseous sphere revolving around itself. (Nebula).

2- As time passes, the nebula lost its heat gradually, so, its size contracted and its revolving speed around itself increased.

3- Under the effect of centrifugal force, the nebula lost its sphere form and became a flat rotating disc.

4- Parts got separated from flat disc by the effect of centrifugal force to form gaseous circles that also rotate in same direction like nebula rotation.

5- The gaseous circles cooled down, frozen formed the planets of solar system.

The remaining flame mass → is the sun.

II- <u>The crossing star theory</u> :

(Chamberlain and Moulton 1905) :

Assumptions , …

1- The solar system was originally a big star (the sun).

2- Another huge star approved to sun.

3- The star attracted the sun's material to it which lead to great expansion in the part of the sun facing it.

4- This expended part was exploded and a gaseous line was formed of great length that occupied the distance between sun and last planet.

5- Due to this explosion sun escaped from the gravity of the star.

6- The gaseous line started to condense due to attraction forces → cooling → planets formed.

3- **The modern theory of the world,…**

(Alfred Hale 1944),…

- This theory is based on what is sometimes seen whean a star greatly glows for a short time to become one of the most shining stars in the sky.
- After a day, its glow disappears gradually to return to its normal nature → this glow is due to the explosion of that star as a result of nuclear reactions that occurs suddenly.
- The star bombs huge amounts of gaseous material when these reaction occurs.

Assumptions

1- The existence of a star rotating near the sun.

2- The star was exposed to explosion due to huge nuclear reactions.

3- The force of the explosion led to the bombing of the star's nucleus away from gravity sun.

4- A cloud of gas remained and subjected to cooling and contraction processes forming planets.

5- The attraction force of the sun controlled the orbits of planets around it.

4- **<u>The more recent theories</u>**:

- The sun was surrounded by a sphere of gas (a mixture of hydrogen and helium) and dust (iron, rocks, ice) called "Solar Nebula".
- **The solar nebula turned into a flat rotating disk, then:**

- The dust compressed together forming four inner planets which are, Mercury, Venus, Earth, Mars.
- The dust and ice combined with gases forming four outer planets which are : Jupiter, starurn, Uranus and Neptune.

Notes

- The earth is the largest inner planet and it has one moon rotating around it.
- Neptune is the smallest outer planet and is four times larger than earth.
- There are 2 moons rotating around Mars and no moons rotating around mercury and venus.
- The difference in length of the day and year from planet to another,...
- **Day** : It is the period taken by the planet to make one complete rotation around its axis.
- **Year** : It is the period taken by the planet to make one complete rotation around the sun.

- **Factors led to the difference in length of the day:**

1- Radius led of the planet.

2- Speed of rotation of the planet around it axis.

Factors led to the difference in the length of the year :

- Distance between the planet and sun.
- Speed of rotation of the planet around the sun.

The longest day is on → Venus.

The shortest day is on → Tupiter.

The shortest year is on → Mercury.

The longest day is on → Neptune.

Activity to explain the difference in the length of the year from a planet to another :

- Draw 4 circles with a united center around 5 students on a play ground.
- Each student stand on one of the circles in a way that all in straight line.
- Using the watch calculate the time that each students takes to make [illegible] rotation.

Observation

The difference in time that each student takes to make a complete rotation is due to the difference in the distance that the student moves around the center.

Conclusion

- The difference in the length of the year from one planet to another is due to :

1- The difference in the distance that each planet takes to rotate around the sun. (The center of the solar system).

2- The difference in the speed of the planets rotation around the sun.

Science, Technology and Society

Weightlessness

- The continuous force of Earth's gravity on our bodies gives us weight.
- But, when you are inside a lift going downward fast, you feel that you are lighter in weight.
- This phenomenon occurs in the spacecrafts as astronauts fall down inside it with same sped, so they get weightless.

Notes :

1- Universe was formed almost in homogenous parts.

2- Gravity helped in gathering of more masses leaving empty spaces between them.

3- Areas of gathered matter form the Galaxies.

Science, Technology and Society

A solar Telescope,…

- Centered on earth or carried into space to study sun.
- Sun light is gathered → then separated by

Spectrometer into spectrum.

(Shows the diff light wave lengths by sun)

- By studing spectrums of sun we can study and get information about sun.
- Solar telescope works on reflecting the sun rays downward to a mirror in a tunnel under earth surface a picture of sun is formed in monitoring room.

Modern equipments

- May be on earth or sent to space to get photos and information.

Examples :

I- Telescopes,…

Rotating in orbits around the Earth so

Can see celestial bodies

catch rays able to penetrate earth atmosphere

II- Spacecrafts

- They are sent in deserted trips to revolve round other plants or land on them.
- These spacecrafts are controlled by computers from surface of Earth.
-

III- The Hubble telescope

- Launced in April 1990.
- Rotates around at height 500km.
- Collect photos → able the astronomers to study the edition of universe.

Space suit

- The first astronauts wore one space suit for the trip.
- Today they wear clothes that differ due to missions they perform.
- There is also a normal type of special clothes to be worn inside spacraft during its rotation.

Cell Division

Unit (4) **Lesson (1)**

The cell is the building unit of living organisms.

Kinds of cells in multicellular organism's body:

1. Somatic cells

↓

- **Way of division** → Mitosis
- **Purpose of division** :
  1- Growth .
  2- Compensation of the damaged cells.

2. Reproductive cells

↓

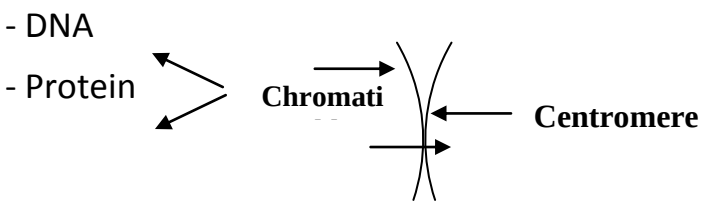
- **Way of division** → Meiosis
- **Purpose of division :**
  1- Formation of male and female gametes.
  2. Transferring of genetic traits from parents to their offspring.

Nucleus is the part that is responsible for the cell division
Because :

It consists the genetic material of the living organism which contains **Chromosomes** that have the main role in cell division.

** **General Structure of the chromosome:**

- Two connected threads each one is called (Chromatid).
- The 2 chromatids are connected at a point called (Centromere).



- Chemically, the chromosome consists of a
  - Nucleic acid → DNA.
  - Protein.

(DNA) → carries the genetic traits of the organism.

- The number of the chromosomes is fixed for same members of same species but different from one species to another.
- The number of chromosomes in
- **human = 4 6**
- rabbits = 44
- Mosquito = 6
- onion = 16.
- Note that in human for example the somatic cells (Such as skin, stomach, blood) contains 46 chromosomes while the gametes contain 23 chromosomes only.

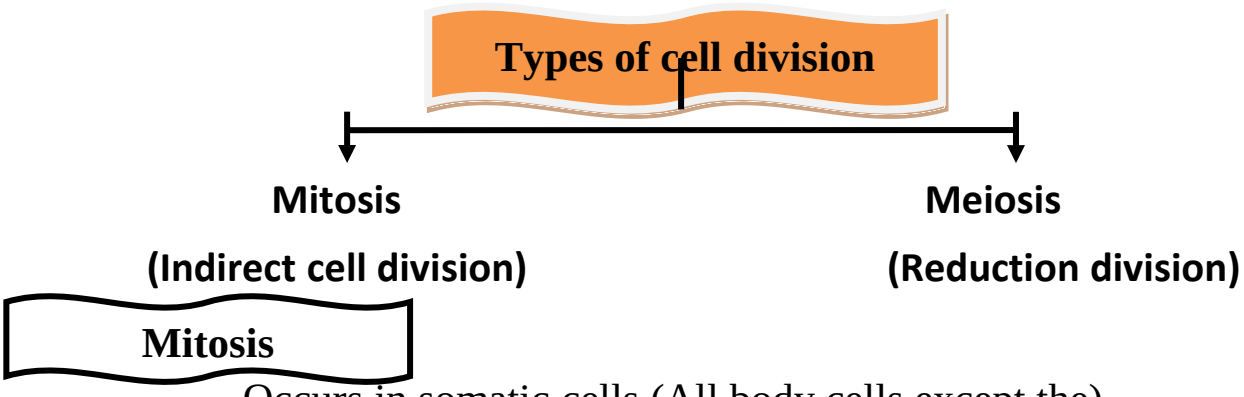
  ↓ ova or sperum

  - (reproductive cell) -

So, somatic cells contain 2 sets of chromosomes one inherited from the father and the other from the mother.

i.e. → Somatic cell → diploid number → (2N).

→ Gametes → Haploid number → N.



Mitosis

- Occurs in somatic cells (All body cells except the).
  - Reproductive cells.
  - Neural cells.

So it is important in – growth.

- compensation damaged cells.

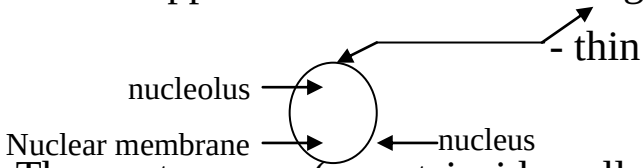
Before cell division the cell passes through a phase called **Interphase :** during interphase

- The cell prepares for division through important biologic process.
- The amount of genetic material Duplicates.

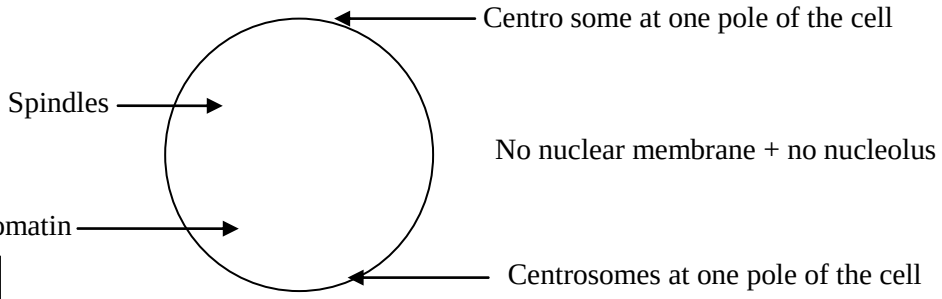
Then cell division start in 4 steps or 4 stages celled phases :

I- Prophase

- Chromatin which is duplicated inside the nucleus is called the chromatin reticulum. Ch. Net ← nucleus.
- The chromatin reticulum intensifies and condensed.
- Then it appears in the form of – long - doubled



- The centrosome (a part inside cell outside nucleus) form spindle fibers called spindle extending between the 2 poles of the cell.
- The nuclear membrane and nucleolus disappear.



N.B

In plant cells no centrosome so the spindles fibers are formed from intensifying cytoplasm at the cell poles.

II-Metaphase :

- Chromosomes are arranged along the cell equator.
- Each chromosome is connected with one of the spindle fibers at its centromere.

III-Anaphase :

- The centromere of each chromosome splits into two haves, so the chromatids separate from each other.
- Spindle fibers begin to shrink and two identical groups of chromatics are formed.
- Each group of chromatids migrate towards one of the cell's poles.

IV-Telophase

- A complete set of chromosomes that have the same number of mother cell's chromosomes are formed on both poles of the cell.
- A nuclear threads are formed and nuclear network is formed around the chromatin material and a new cytoplasmic membrane leading to the formation of 2 new separate cells.
- Each cell has the same number of chromosomes of parent cell (2 N).

N.B

If for any reason the number of the parent cell didn't have the same number of the off-spring cells so, this resulted cells will have different properties → damage or disease to the organism.

****

Meiosis

- Occurs in living organisms that reproduce by gametes.
- In human and animals it occurs in the test is → for male gametes and in the ovary to produce female gametes. (sperm ♂ + ova ♀).
- In flowering plants it occurs in the (anther) to produce male gametes → pollen grains. While the female gametes are produced from the ovary (eggs).
- Production of haploid number (N) gametes (contain half the number of chromosomes of the parent cell).

Phases of meiosis:

- Interphase → chromosomes are doubled only once.
- First meiditic division → (Reduction), of chromosome no.
- Second meiotitic division → Increase no. of cell production.

First meiotitic division,…

I- Prophase I,…

- Chromatin reticulum intensifies and appears in the form of distinct chromosomes.
- Chromosomes are arranged in homologues pairs each pair consists of (4) chromosomes so it is called **Tetrad.**
- Each 2 homologues chromosomes in the tetrad move away from each other.
- Each chromosome consists of two chromatids linked together by the centromere.
- The spindle appears and the chromosomes connect to spindle fiber.
- The nuclear membrane disappears.

II-Metaphase I,...

Chromosomes pairs arrange at the cell equator.

III- Anaphase I

- Every two homologues chromosomes move away from each other as the spindle fiber shrink.
- One of the two chromosomes nigrates towards a cell pole and the other nigrates towards the other pole.
- Therefore, each pole contains half the number of the chromosomes of the parent cell.

IV-Telophase I

- A nuclear membrane is formed around the chromosomes at each of the cells poles leading to the formation of 2 nuclei.
- Each nucleus contains half the original number of chromosomes of the parent cell i.e. each cell contains (N) chromosomes.

**** After telophase I, the cell enters into the second meiotic division,…**

**** Second meiotic dvision,…**

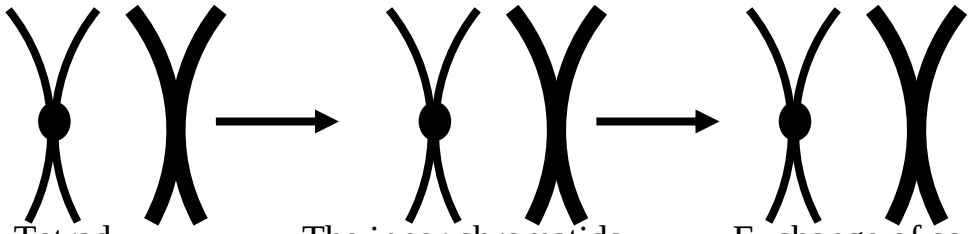
It aims to increase the number of the produced cells from the first neiotic division.

- Each produced cell is called a gameter that contains half the number of chromosomes of the parent cell.
- Each cell of the 2 cells resulted from the first meiotic cell division is divided in a way similar to mitotic cell division.
- In the final phase (Telophase II) of this division, 4 four cells are produced and each of them contains half the number of chromosomes of the parent cells.

Cross over phenomena,

It is a phenomenon that takes place at the end of prophase I where some parts of the two inner chromatids of each tetrad are exchanged to produce new genetic arrangements.

So, cross over phenomenon responsible for the difference between members of some species.



Tetrad — The inner chromatids of homologous chromosomes come close to each other — Exchange of some parts of the 2 inner chromatids in tetrad.

Importance of cross – over phenomenon,

Cross over phenomenon has on important factor for the variation of genetic traits among members of the same species → as the exchange between the 2 inner homologues chromosome's chromatids and distribute them randomly in the gametes.

(Science, Technology and Society)

- How to prepare a slide from the growing tip of onion's root,…

1- Plant the onion in a beaker of water until it gives out roots with 2-3 cm in length.
2- Cut some growing roots from the top with 1-2 cm length by a scalpel and put those roots in a glass tube.
3- Add 1-2ml hydrochloric acid 18% to the roots for 20min, then put the tube in a water bath with a temp 50°C for 7min.
4- Wash the roots in distilled water to get rid of the acid, then add 1-2ml fulgen sol[2] to the roots and leave them 30min.
5- Using the scalpel cut the growing tip carefully and add 2 drops of acetic acid and use a tweeze to carry them and put on a clean glass slide.
6- Cover the root tip with cover slip and press by thumb.
7- Evamine the slide by a compound microscope and study phases of mitosis.

(Technological Application)

I- Nanotechnology and Cancer Treatment :

- Cancer occurs when the body cells are divided continually without controlling.

- The mass resulted from this is called (Tumor).
- Using nanotechnology, scientists have developed smart microscope boms that penetrate cancer cells and explode them from inide.
- They were used to kill the cancer cells in an experimental nice- Mice suffered from cancer were able to live 300 days after this ttt. Other mice that didn't receive this treatment didn't live more than 43 days.
- The Egyptian scientist Dr. Mustafa El-Said discovered a way to detect a cancer cells.
- This teq. Starts by loading protein (they have the ability to attach to the canorous cell secretions with a NANO molecules of gold.

Injecting them into palient :

- The infected cell surface and proteins get intertwined with golden molecules to make it possible to monitor the infected cells through a microscope each cell separately.
- The method of treatment is focusing laser with a certain degree to the gold molecules, then it absorbs the light and convert it into heat which leads to burn and kill infected cell that has suck to them.

2- Liver Transplantation :

Some cells in the human body are not divided at all such as nerve cells and red cells of blood.

Some cells are not divided in normal conditions but they retain the ability to divide under certain circumstances → like liver cells.

For example if the liver gets or injured or a part of it is cut the remaining cells undergo division to compensate the missing part.

Unit (4) **Lesson (2)**

Sexual and Asexual Reproduction

- **Reproduction process** :

It is a biological process, where the living organism produces new individuals of the same kind and thus → ensuring its continuity.

Types of reproduction :

A. Asexual reproduction

In which the living organisms produces new individuals have genetic traits identical to the parent. Occurs in :

- Unicellular living organisms. (yeast or Amoeba).
- Some multicellular animals and plants.

It takes place by mitosis division so no

No → * need for special systems or structures.

No → * change in genetic structure.

The daughter cells is **identical** to the parent cell.

Types of asexual rep.

I- Binary fission

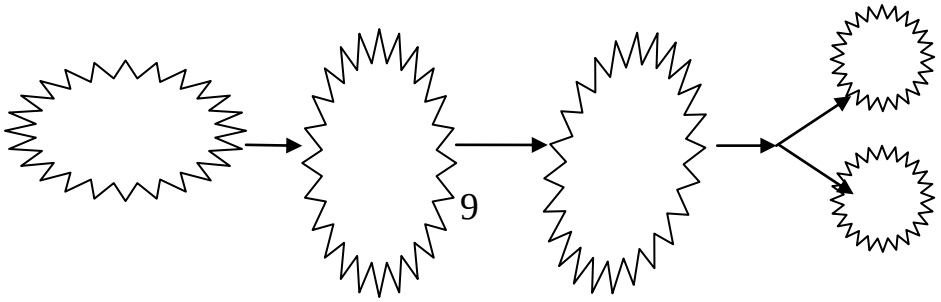
Occurs in * unicellular orgaism

e.g → Ameoba – paramecium – Euglena.

* Algae and bacteria.

The nucleus divides by **mitosis** and the cell splits into 2 cells.

Each cell grows and become new individual.



II- Budding

- Occurs in → unicellular yeast fungus.

  → Multicellular

  Organisms → Hydra or sponges.

Lateral bulge in the cell → then cell nucleus dividends into (2) nuclei one of them remains in the parent cell and the other migrate to the bud.

The bud grow gradually and remains connectected to the paren cell unti it fully grown, then it separates from it.

N.B

If the buds remains connected to the parental cell colony is formed.

(Chain) = (Colony)

Budding → Mitosis.

III- Regeneration

It is the ability of animals to compensate their missing parts. i.e the living organism can reproduce by one of its parts.

Occurs in some animals → star fish.

Starfish arms could be revived (regenerate) and give out a complete animal if they contain a part of the central disc of the animal.

Mitosis

IV- Spore propagation

Occurs in some fungi such as bread mould and mushrooms.

Fungi have special organs called sporangia each sporangium has a large number of spores that be released on that be released on

rupturing has a large number of spores that be released on rupturing of its wall.

When spores are scattered on a suitable environment they grow to give new organisms (fungi).

So on bread if a spore is placed on awet bread it will give new fungus by Mitotic.

V- Vegetative

It occurs in plants by mitotic division it occurs without the need of seeds but by the plants vegetative organs in order to produce new plants identical to parent plant.

It also occurs by plant cells in tissue culturing.

II- Sexual Reproduction

- Occurs in higher living organisms.
- Occurs between 2 parental individuals one of them is male and the other is female.

It depends on 2 min processes :

1- Genets formation.
2- Fertilization.

I- Gametes formation

- Gametes are formed in the reporudctive cells by the meiotic division.
- Gametes contain half chromosomes number (N) of the organism's reproductive cells (2N).

II- Fertilization

- It is the combination of male gamete and female gamete to form a zygote which contains the normal number of chromosomes of the organisms.

- Zygot contain gentic material from both parents, and when it grows, it given a new offspring with traits of its parents.
- Note that sexual reproduction is a source of genetic variation bec of the off spring resulted from 2 sources male and female i.e the resulted off spring has new genetic traits that combine the parents to children.

Comparison bet. Sexual and asexual reproduction

Sexual	Asexual
- It occurs by 2 living organism, one of them is male and the other is female.	- It occurs by only one living organism.
- Occurs in most higher living organism like plants, animals	- Unicellular and some multi-cellular organisms.
- Meiotic division	- Mitotic division
- New off spring combines the genetic traits from 2 sources.	- The new off spring gets a full copy of parent individual genetic trait.

The End
GOOD LUCK